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December 3, 2009

Mr. Dave Seter
Remedial Project Manager
U.S. Environmental Protection Agency Region 9
75 Hawthorne Street, SFD-8-2
San Francisco, CA 94105

Subject: **Pumpback Well System Characterization Work Plan Addendum (Revision 1), Yerington Mine Site, Lyon County, Nevada: Administrative Order for Remedial Investigation and Feasibility Study, EPA Docket No. 9-2007-0005**

Dear Mr. Seter:

Atlantic Richfield Company (ARC) has prepared this revised *Pumpback Well System Characterization Work Plan Addendum* (Addendum) to supplement the field and analytical activities described in the *Pumpback Well System Characterization Work Plan* (PWS Work Plan) dated December 30, 2008. The PWS Work Plan was approved by the U.S. Environmental Protection Agency - Region 9 (EPA) on February 13, 2009. A concurrent and related *Shallow Zone Characterization Work Plan* dated December 30, 2008, was also approved by EPA on February 13, 2009. ARC submitted a draft Work Plan Addendum to EPA on September 23, 2009. EPA provided comments to the draft Work Plan Addendum on October 24, 2009 and, as requested by EPA, ARC responded to EPA comments on November 23, 2009 with the acknowledgement that this revised Work Plan Addendum would be submitted to EPA prior to the December 10, 2009 groundwater technical meeting.

Aquifer testing and associated activities described in this Addendum will be performed as an interim phase of groundwater investigations required under the Administrative Order for Remedial Investigation and Feasibility Study, EPA Docket No. 9-2007-0005 dated January 12, 2007. Activities associated with this Addendum will be performed in 2010, and will complement other groundwater investigations to be performed pursuant to a revised *Site-Wide Groundwater Remedial Investigation Work Plan for Operable Unit 1* (Groundwater RI Work Plan). Pending further discussions with EPA, ARC anticipates that the revised Groundwater RI Work Plan for the Yerington Mine Site (Site) will be submitted in late March 2010. The location of the Site and the PWS are shown on Figures 1 and 2, respectively.

The aquifer test program has been designed to achieve the following objectives: 1) improve our understanding of the effectiveness of the pumpback wells in limiting the migration of mine-related groundwater to off-Site, down-gradient receptors; and 2) optimization of future PWS operations. Two phases of aquifer testing are planned, the first from April to August 2010 during the irrigation season and a second phase from October to December 2010 during the non-irrigation season. In order for the first four activities listed below to be implemented prior to the resumption of PWS operations in late March 2010, a mid-late January approval by EPA is requested:

1. Pumpback well rehabilitation;
2. Installation of 32 piezometers around the 11 pumpback wells, as shown in Figures 3 through 7 (P-1 is an existing piezometer installed proximal to pumback well PW-10S);
3. Development and surveying of the new piezometers;
4. Installation of pressure transducers and data loggers in the wells and associated piezometers;
5. Re-start of the pumpback well system in late March 2010; and
6. Individual pumpback well shutdowns and performance of four-day aquifer recovery tests followed by pumpback well re-starts and four-day pumping aquifer tests for each of the pumpback wells with the measurements of head conditions in the pumpback wells and associated piezometers.

Potential Continued Shutdown of PW-1S

The recovery/pumping tests for PW-1S are indicated below as 'if needed' because ARC has requested EPA's consideration of not resuming pumping of PW-1S in March 2010 because groundwater pumped from this well is located on the east side of a persistent groundwater divide between the Site and the adjacent irrigation fields. The potentiometric surface maps provided in Attachment A indicate that groundwater flow in the area of PW-1S is towards the east or northeast, depending on the season with respect to irrigation pumping (the Peri Farms well is located northeast of PW-1S). Given its location, PW-1S only pumps irrigation water from the shallow alluvial aquifer that has been directly recharged from agricultural operations (i.e., it recycles irrigation water and does not pump groundwater from beneath the Site, and has no affect on limiting off-Site migration of chemicals sourced from the Site). PW-1S was installed at a time (1985) when groundwater flow conditions at the Site were not well understood and, given our current understanding of flow and chemical conditions, it is not needed to control off-Site migration of mine-related groundwater.

Pumpback Well Rehabilitation

A well rehabilitation program will be conducted prior to aquifer testing to clean the well screens in order to obtain the maximum groundwater extraction rates from each well during the testing program. Well rehabilitation will be performed by an experienced Nevada-licensed well contractor under the supervision of Brown and Caldwell hydrogeologists, in a similar manner as recent pumpback well rehabilitation efforts. The well rehabilitation activities will include:

- Down-hole video surveys;
- Brushing the well casing and screens with a nylon brush;
- Air-jetting the well to further loosen and remove incrustation;
- Injecting dry acid and a liquid surfactant;
- Allow a minimum of 24 hours working time for the injected acid and surfactant while agitating with a tight-fitting rubber swab and/or air;
- Additional brushing following the acid treatment and horizontal jetting; and
- Remove loose material from the well using an air-vac suction procedure.

Down-hole video surveys of each well will follow the well rehabilitation effort to document the condition of the wells and the depths of the tops and bottoms of the well screens. The post-rehabilitation video surveys will be conducted after allowing sufficient time for the water in the wellbore to clear.

Chemicals to be used in the well rehabilitation effort, which include a dry acid compound and a liquid surfactant, are manufactured and distributed specifically for the rehabilitation of municipal, domestic and agricultural water supply wells. These chemicals will be used according to manufacturer's recommendations, and will not adversely affect aquifer materials or groundwater quality (MSDS sheets are provided in Attachment B). The dry acid compound is certified to NSF/ANSI Standard 60, Drinking Water Treatment Chemicals - Health Effects. The MSDS for the liquid surfactant states that the product is not expected to be harmful to aquatic life nor have any significant environmental persistence or bioaccumulation. Baking soda will be available to buffer the acid solution, if necessary.

Water discharged during the well rehabilitation effort will be neutralized with respect to pH prior to discharge, if necessary, and conveyed to the inactive PWS evaporation pond via the existing discharge lines. These chemicals have been used in previous well rehabilitation efforts with discharge to the evaporation ponds with no observable adverse affects to groundwater chemical conditions. The total volume of water to be discharged from well rehabilitation activities is conservatively estimated at 2,500 gallons, based on an average saturated thickness of 20 feet and the removal of 10 times the casing volume for each well. Following the completion of the rehabilitation and well video efforts, the pumps that were removed from the PWS wells will be re-installed. Each well will then be pumped for a brief period (i.e., up to 30 minutes) to verify that the pumps and controls are functioning properly.

Piezometer Installations

The number of piezometers included in an aquifer test is dependent on the amount and accuracy of information needed, and the objectives of the aquifer test. In general, three piezometers are recommended (Kruseman and de Ridder, 2000) to allow for time-drawdown and distance-drawdown analyses and an assessment of a larger volume of the aquifer. Data from this type of monitoring array will also allow for an assessment of well efficiency.

<u>Piezometer Locations</u>
Three piezometers will be installed near each of the pumpback wells (PW-10 already has an associated piezometer, P-1. installed approximately seven feet from the well). Approximate piezometer locations, including the location of P-1, are shown on Figures 3 through 7. Installation elevations and 20-foot screen intervals for the piezometers will match the construction of the individual pumpback wells, as summarized in Table 1.

Prior to installation, the piezometer sites will be identified in the field and surveyed by a registered Nevada surveyor. If necessary, the piezometer screen depths will be adjusted during installation to account for differences between the ground surface elevation of the pumpback well and the associated piezometer to ensure that screen elevations of the piezometers match those of the associated pumpback well as closely as possible.

An important objective for establishing piezometer locations is to locate them at distances that would provide data that are integrated over a relatively large area of the aquifer. Therefore, the extent of measureable drawdown during aquifer testing is an important element of the piezometer design for each well. Planned locations relative to the pumpback wells were established using the Theis (1935) solution to estimate the extent and magnitude of drawdown induced by each pumpback well. The observed average pumping rate for each of the wells during the final 10 days of pumping (March 16 to March 25, 2009) prior to the PWS shutdown, presented in Table 2, were input into the Theis (1935) solution.

Table 1. Pumpback Well and Piezometer Screened Intervals					
Well	Ground Surface Elevation (feet-amsl)	Planned Piezometer Screen Interval		Pumpback Well Screen Interval	
		feet bgs	Elevation (feet-amsl)	feet bgs	Elevation (feet-amsl)
PW-1S	4360.6	28-48	4332.6 – 4312.6	27.5-48	4333.1 – 4312.6
PW-2S	4367.1	32-52	4335.1 – 4315.1	31.5-52	4335.6 – 4315.1
PW-3S	4371.5	38-58	4333.5 – 4313.5	37.25-57.75	4334.25 – 4313.75
PW-4S	4366.0	35-55	4331.0 – 4311.0	34.5-55	4331.5 – 4311.0
PW-5S	4368.4	35-55	4334.4 – 4314.4	34-54.5	4334.4 – 4313.9
PW-6S	4368.0	28-48	4340.0 – 4320.0	28-45	4340.0 – 4323.0
PW-7S	4365.8	27-47	4338.8 – 4318.8	26.5-46	4339.3 – 4319.8
PW-8S	4366.2	30-50	4336.7 – 4316.7	29.5-49.5	4336.7 - 4316.7
PW-9S	4366.4	29-49	4337.4 – 4317.4	29-49	4337.4 – 4317.4
PW-10S	4365.6	27-47	4338.6 – 4318.6	27-47	4338.6 – 4318.6
PW-11S	4368.7	29-49	4339.7 – 4319.7	29-49	4339.7 – 4319.7

Aquifer transmissivity values for the solutions were obtained from the pumpback well shutdown aquifer recovery test data acquired in March 2009, as presented in Attachment C. An additional hydraulic parameter required for the Theis (1935) solution, aquifer storativity, has not yet been determined for the pumpback wells. Storativity values of 0.01 and 0.1 (dimensionless) were selected to evaluate predicted drawdown based on the typical range of 0.01 to 0.3 for unconfined alluvial aquifers (Driscoll, 1995).

Although it has not yet been determined whether the shallow zone of the alluvial aquifer in the PWS study area is confined or unconfined, the assumption that the aquifer is unconfined is conservative with respect to the ability to measure drawdown at the piezometers within the time frame of the planned aquifer testing program. Drawdown in an aquifer with a relatively higher value of storativity will propagate at a slower rate than drawdown in an aquifer with a lower value of storativity, although the magnitude of drawdown at a given distance will eventually be equal for both cases.

Distances between pumpback wells and associated piezometers were determined using estimates of the extent and magnitude of drawdown derived from the Theis (1935) solution. Table 3 presents the estimated drawdown after 12 hours of pumping at 50, 25, and 10 feet for each well with storativity values of 0.01 and 0.1. Piezometer locations for the analysis are shown in Figures 3 through 7 (the more conservative storativity value of 0.1 was used to locate the piezometers).

The planned duration of four days for the aquifer tests would likely yield higher aquifer drawdown values than presented in Table 3. Actual piezometer locations will be based on field access and other limitations such as the locations of buried utilities and the need to maintain access to each of the pumpback wells. However, the distances listed in Table 3 will be adhered to as closely as field conditions allow.

Table 2. Pumpback Well Average Pumping Rates	
Well ID	**Average Pumping Rate (gpm)**
PW-1S (if needed)	13.4
PW-2S	8.0
PW-3S	4.5
PW-4S	2.5
PW-5S	4.4
PW-6S	2.5
PW-7S	1.7
PW-8S	0.22
PW-9S	1.4
PW-10S	0.7
PW-11S	0.7

Borehole Drilling and Piezometer Construction

Hollow stem auger drilling methods will be used to install the piezometers, which will be constructed with a six-inch diameter steel surface casing, and two-inch diameter schedule 40 polyvinyl chloride (PVC) tubing as the blank (i.e., unscreened) portion of the well. The piezometers will be constructed within the hollow stem auger flights. As described above, piezometers associated with individual pumpback wells will be constructed to accurately match the screen interval for each well based on pre-construction surveys.

A 20-foot, 0.020-inch slotted screen constructed of schedule 40 PVC will be installed in each of the piezometers. A two-inch flush-threaded PVC end cap will be placed at the bottom of the screened interval. A filter pack consisting of #3 silica sand will be placed against the screen and will extend approximately two feet above the top of the screen interval. Approximately two feet of bentonite chips will be placed on top of the filter pack. Following full hydration of the bentonite chips, a cement grout seal will then be placed in the annular space from the top of the bentonite chips to ground surface. The depths of the filter packs and bentonite seals will be tagged with a measuring tape within the hollow stem auger flights to assure correct placement.

After the cement surface seal has cured, each piezometer will be developed to remove fine-grained material from the well and to improve the hydraulic connection to the screened portion of the alluvial aquifer. Development procedures will include surging the well and periodically bailing fine-grained material until the turbidity of the discharge water is less than or equal to 10 NTUs or has stabilized (i.e., varies less than +/- 10 percent over three successive casing volumes). All piezometers will be surveyed by a registered Nevada surveyor to establish the groundwater elevation measurement points.

Table 3. Predicted Drawdown and Piezometer Installation Distances							
	Hydraulic	Predicted Drawdown at 12 Hours (feet)			Installation Distance from Pumping Well		
	Conductivity	Distance from Pumping Well			Piezometer 1	Piezometer 2	Piezometer 3
Well ID	(feet/day)	50 Feet (S=0.01/0.1)	25 Feet (S=0.01/0.1)	10 Feet (S=0.01/0.1)	(feet)	(feet)	(feet)
PW-1	78	0.55/0.24	0.72/0.43	0.96/0.66	50	25	10
PW-2	43	0.56/0.18	0.78/0.41	1.07/0.70	40	25	10
PW-3	35	0.34/0.09	0.48/0.25	0.66/0.43	30	15	7
PW-4	30	0.26/0.07	0.37/0.19	0.51/0.34	25	15	7
PW-5	57	0.32/0.13	0.43/0.24	0.58/0.39	25	15	7
PW-6	83	0.13/0.05	0.18/0.11	0.24/0.17	20	10	5
PW-7	11	0.32/0	0.58/0.13	0.90/0.49	20	10	5
PW-8	1.3	0/0	0.19/0	0.52/0.09	20	10	5
PW-9	60	0.18/0	0.29/0.11	0.42/0.25	20	10	5
PW-10	14	0.13/0	0.24/0.05	0.37/0.20	20	10	7
PW-11	36	0.09/0	0.14/0.06	0.21/0.13	20	10	5

Each of the pumpback wells and piezometers will be equipped with In-Situ, Inc. Level TROLL® 700 vented pressure transducers (transducers), rated at 15 PSI with an accuracy of ±0.1 percent of the sensor's full scale (i.e., the 15 PSI-rated transducer has a range of 0 to 15 PSI, and therefore an accuracy of 0.1 PSI, or approximately 0.03 feet). Transducers will be installed via vented data cables that allow for changes in barometric pressure, and will be suspended from top of the well monument by the manufacturer-supplied Kellems Grip® cable retention device, approximately two feet above the bottom of the well or piezometer. Standard operating procedures (SOPs) for pressure transducer use are provided in the Site-Wide QAPP (Revision 5; ESI and Brown and Caldwell, 2009).

Aquifer Recovery and Constant Rate Pumping Testing

Following the startup of the pumpback well system in late March 2010, all of the pumpback wells will be pumped at normal operational rates, generally similar to those listed in Table 3, on a continuous basis for a minimum three-week period. Subsequently, a series of aquifer recovery tests and pumping tests will be conducted by successively shutting down non-adjacent pairs of pumpback wells for a period of four days and then re-starting them while monitoring water level responses in the pumpback wells and associated piezometers. Upon completion of testing in each pair of wells, testing will begin in the next pair.

Groundwater elevation measurements in the pumpback wells and piezometers will be used to estimate aquifer hydraulic parameters, as described below. Results from this series of aquifer tests will be representative of conditions during the irrigation season. This aquifer testing procedure will be repeated beginning in mid-October 2010 to represent conditions when agricultural irrigation is not occurring. The planned relative schedule for aquifer testing is presented in Table 4.

Table 4. Pumpback Well Test Schedule	
Well Pair	**Test Number**
PW-10S/PW-3S	1
PW-2S/PW-4S	2
PW-5S/PW-7S	3
PW-6S/PW-8S	4
PW-9\PW-11S	5
PW-1S (if needed)	6

Discharge Rate Monitoring
Flow rates will be monitored using the Sensor II® totalizing flow meters currently installed at each pumpback well, and adjustments to flow rates will be made with the control valves installed at each pumpback well. Flow rates will be maintained as closely as possible to the rates presented in Table 2. During each testing period (i.e., April-August and October-December), flow rates will be monitored, and adjusted if necessary, on a daily basis Monday through Friday at each of the pumpback wells beginning 10 days prior to the shutdown of the first pumpback well pair and continuing through the end of the testing period. Totalizer readings will be recorded and the average pumping rate for the previous 24-hour period will be calculated by dividing the gallons pumped by the elapsed time between readings. The instantaneous flow rate will be recorded, and the control valve will be used to adjust flow if necessary. These readings will be recorded in a field form developed for the aquifer tests. Pumpback well shutdowns would be scheduled to occur on a Monday, with re-starts occurring on the following Friday.

During the re-start (i.e., pumping test phase) of each pumpback well pair, the flow rates will be monitored using the instantaneous flow rate indicator and adjusted every minute for the first five minutes of pumping, then every five minutes for the first hour of pumping, and then hourly for the next eight hours. Totalizer readings will be recorded prior to start-up, and then on the same schedule beginning at five minutes, and the flow rates will be calculated to verify the instantaneous flow rate readings. The next flow rate monitoring and flow adjustments would occur on the following Monday morning, and a final totalizer reading would be recorded on Tuesday. Manual confirmation of flow rates (i.e., bucket and stopwatch) will not be possible because the wells pump into a common discharge pipeline.

Water Level Monitoring
Transducers installed in the pumpback wells and associated piezometers will be programmed to record water levels at daily intervals when they are installed. Water level data will be downloaded to an In-Situ, Inc., Rugged Reader. The transducers will subsequently be programmed to record:

- hourly readings 24 hours prior to shutdown;
- one-minute readings for the first hour following shutdown/startup;
- five-minute readings from one hour to 24 hours after shutdown/startup;
- hourly readings until the conclusion of shutdown/startup phase;
- daily readings following the end of the four-day re-start monitoring.

Manual water level measurements will be conducted to backup the transducer measurements. For the recovery segments of the tests, manual water levels will be collected from the pumpback wells being tested and the associated piezometers immediately prior to shutdown and then at the times provided in Table 5. The schedule presented in Table 5 will be used for manual measurements of drawdown in the re-start segments, but no measurements will be collected on days two and three (Saturday and Sunday). All manual measurements will be performed using an electronic water level probe following SOPs provided in the QAPP, and all measurements will be recorded on aquifer test field forms.

Table 5. Piezometer Manual Water Level Measurement Schedule

Time Since Shutdown/Restart (minutes)	Approximate Measurement Time Intervals (minutes)
0 to 10	2.0
10 to 30	5.0
30 to 60	10
60 to 120	20
120 to 240	30
240 to 480	60
480 to 5,760	3 times daily

In addition to the wells and associated piezometers, two of three existing intermediate zone monitor wells (Figure 8) not currently equipped with pressure transducers will be so equipped (LEP-MW-9I is currently equipped with a pressure transducer/data logger). Well LEP-MW-4I is located near PW-10S, W5AB-3I is located near PW-8S, and LEP-MW-9I is located near PW-5S.

Health and Safety

All field activities will be conducted in accordance with the revised Site-Wide Health and Safety Plan ("Site HASP") for the Yerington Mine Site (Brown and Caldwell, 2007). The HASP identifies, evaluates and prescribes control measures for health and safety hazards, including radiological hazards, and describes emergency response procedures for the Site. HASP implementation and compliance is the responsibility of Brown and Caldwell, with ARC taking an oversight and compliance assurance role.

A current copy of the Site HASP will be located at the field office where it will be available to site workers at all times. The Site HASP includes the general site safety requirements:

- Safety and health risk or hazard analysis;
- Employee training requirements;
- Personal protective equipment (PPE);
- Medical surveillance;
- Site control measures;
- Decontamination procedures; and

- Emergency response.

A project-specific Health and Safety Plan (Project HASP) will be prepared prior to implementation of the field work described above, and will include specific safety procedures and requirements that are applicable for the tasks required to complete the project. The Project HASP is considered a dynamic document and may be modified and updated throughout implementation of the work and will be made available to all workers and visitors during implementation of field activities. The Project HASP will include the following detailed safety information:

- Identification of roles and responsibilities for the project, including safety roles;
- Project specific standard operating procedures (SOP), if applicable;
- Identification of control of work permits and required safety procedures to implement the work (e.g. ground disturbance, working at heights);
- Planning procedures if simultaneous operations (SIMOPS) will be occurring that may conflict or interfere with each other;
- Project and job specific risk assessments and mitigation; and
- Task Safety and Environmental Assessment (TSEA).

Aquifer Test Analyses

Water level response data collected from each of the pumpback wells will be analyzed to estimate the shallow aquifer hydraulic properties in the areas of the individual wells, including transmissivity, hydraulic conductivity and storativity. Selection of the appropriate tool or model to analyze the aquifer test data will be the first step in the analytical process (Kruseman and de Ridder, 2000). ARC plans to use spreadsheet analytical tools and/or AQTESOLV software, based on analytical solutions developed by Theis (1935), Cooper-Jacob (1946), Neuman (1974), or Hantush (1960) as appropriate for the aquifer response and test type (i.e., pumping or recovery).

Plots of the water level drawdown and residual drawdown (i.e., recovery test) versus time will be created prior to aquifer test analyses to determine the type of aquifer system the drawdown data from the pumping test best represent (i.e., confined, semi-confined or unconfined). The characteristics of these log-log and semi-log plots of drawdown versus time will be compared with theoretical models of aquifer systems to classify the aquifer characteristics. The residual drawdown data are more reliable because recovery occurs at a constant rate, whereas a constant discharge during pumping if often difficult to achieve in the field (Kruseman and de Ridder, 2000). Presentation of aquifer test analyses will include time-drawdown and distance-drawdown curves, discussions regarding the choice of theoretical models chosen, and the estimated values of transmissivity, hydraulic conductivity, and storativity.

Capture Zone Analysis

A capture zone refers to the three-dimensional region that contributes the groundwater extracted by one or more wells (Figure 9). A capture zone in this context is equivalent to the zone of hydraulic containment (EPA, 2008). The capture zone analysis of the pumpback wells will be performed using two-dimensional analytic element flow models (flow models) and particle tracking. Other methods of capture zone analysis commonly applied to groundwater remediation systems include: 1) contouring water level surfaces and analysis of flow lines to the wells; 2) a comparison of water level elevations in piezometer pairs that indicate flow toward containment wells; and 3) capture zone calculations (EPA, 2008). Prior to the start of analytic element flow modeling, ARC will discuss aquifer test results with EPA hydrogeologists to confirm appropriate modeling activities.

<u>Analytic Element Flow Modeling</u>
Two-dimensional analytic element groundwater flow models (flow models) will be used to delineate the hydraulic capture zones of the pumpback wells (i.e., the effectiveness of limiting the off-Site migration of mine-related groundwater). Hydraulic data derived from the planned aquifer tests will be used in the construction of the flow models. Model construction will incorporate: 1) the defined lower boundary of the shallow zone; 2) gradients and flow direction (reference heads will be established at locations sufficiently distant from the wells to eliminate artificial effects on simulations); and 3) the assumption that hydraulic capture zone for each well will extend throughout the vertical extent of the shallow zone.

Pumping rates for the simulated pumpback wells will be assigned according to the pumping rates observed in 2010-2011, which will likely be similar to the rates shown in Table 2. Simulation pumping rates will be discussed with EPA prior to running simulations. All flow model simulations will be run in steady-state mode and will only include the shallow zone of the alluvial aquifer. The saturated thickness, flow direction and gradient of the shallow zone will be simulated for each pumpback well for: 1) a representative hydraulic gradient scenario selected from 2010 groundwater elevations measured during the agricultural irrigation season and 2) a representative hydraulic gradient scenario selected from 2010 groundwater elevations measured during the non-irrigation season (i.e., October through December). Twenty-two simulations will be run for the capture zone analyses for the 11 pumpback wells. The 20 or 22 flow models (20 if PW-1S is not tested) will be adjusted for the localized flow directions and gradients. Results of the aquifer test analyses described above will be used to determine a range of aquifer hydraulic parameters for input to the models, and the range will be used in the simulations to assess the effects that uncertainties in hydraulic parameters have on simulation results.

<u>Particle Tracking</u>
Particle tracking will be used in conjunction with the steady-state groundwater flow simulations to estimate the extent of hydraulic capture of the individual wells, considering only advective movement (i.e., no retardation or dispersivity). For each of the 20 or 22 flow simulations, particles will be started from a circular pattern surrounding each of the pumpback wells, and will be run in a reverse tracking mode for a period of two years (i.e., using steady-state conditions, the simulated particles will be tracked from their starting locations backwards in space and time).

Data Summary Report

Results of the aquifer testing proposed in this Addendum will be presented in the data summary report (DSR) that will document findings from the PWS Characterization Work Plan. Aquifer test field forms will be appended to the DSR, which will summarize field testing aquifer analytical results. Water level data from the pressure transducers and the aquifer tests solutions will be attached in electronic format. A description of each model and particle tracking simulation will be included. Model outputs will include graphics that compare the modeled capture zones of the pumpback wells with observed groundwater elevation contours. Particle tracking plots will illustrate the region within the shallow zone that supplies groundwater to the pumping well (i.e., within the capture zone) for the two-year simulation period. The DSR will also provide recommendations regarding future operation of the pumpback wells.

Schedule of Planned Activities

A schedule for the field and analytical activities described above, and the submittal of the data summary report, is provided in Figure 10.

References

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If you have any questions or comments regarding this PWS Work Plan Addendum, please contact me at 714-228-6774 or via e-mail at Jack.Oman@bp.com.

Sincerely,

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